



Resilience in Dairy Farming



Nikki Pilania Chaudhary



A Success Story





Trust for Advancement of Agricultural Sciences (TAAS)

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Harnessing the potential of agricultural science for the welfare of the people.

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Resilience in Dairy Farming

A Success Story

Nikki Pania Chaudhary



Progress Through Science

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Progress Through Science



FOREWORD



India ranks first in the world in both production and consumption of milk since 1998 with a sustained growth in the availability of milk and milk products. India also has the largest dairy herd with over 300 million bovines in the world and contributes 23 per cent of global milk production. Milk production has grown at a compound annual growth rate of about 6.2 per cent to reach 210 mt in 2021-22 from 146.31 mt in 2014-15 where dairy is the single largest agricultural commodity contributing 5 per cent of the national economy, witnessing 6.4 per cent CAGR in the past 5 years. Indian dairy is expected to grow by 9-11 per cent in 2022 and is a major contributor to farmers' income as approximately 70 million farmers are directly involved in dairying. It is the largest commodity in terms of value. The top 5 milk-producing states are Uttar Pradesh (16.3%, 30.52 mt), Rajasthan (12.6%, 23.69 mt), Madhya Pradesh (8.5%, 15.91 mt), Andhra Pradesh (8%, 15.04 mt) and Gujarat (7.7%, 14.49 mt).

Dairying is vital for Indian consumers who are largely dependent on milk and milk-based products to meet their protein and calcium requirements. Despite being an important sector for farmers, consumers and the rural economy, dairy is unfortunately the most undeveloped sector. The milk productivity per cow per year in India is quite low – only 987 kg compared to global average of 2,200 kg. The dairy industry in India serves as a tool of socio-economic development. Keeping this in view, the Government of India has introduced various schemes and initiatives aimed at the development of dairy sector in the country. Recently, Ministry of Micro, Small & Medium Enterprises announced a US\$ 2.1 billion infrastructure development fund to promote dairy, meat processing and animal feed plants which in return is expected to create 3.5 million jobs. The private participation in the Indian dairy sector also has increased over the past few years with focus on



farmer producer companies (FPOs), and promotion of value-added products such as cheese, yoghurt, probiotic drinks, mozzarella, etc.

Seeing the poor and unhygienic dairies in *terai* area of Pilibhit and around, both Ms Nikki Pilania Chaudhary and her husband Mr Gaurav Chaudhary plunged into the dairy sector and established a Modern Dairy Farm named as 'Mango Dairies' with the aim of catering the needs of Pilibhit and nearby areas. The farmers and entrepreneurs in the area were provided the needed hands-on training to enhance their knowledge and skills which enabled them to set-up their own dairies giving them good income. This is indeed a good example of how a young woman, born and brought up in an elite urban family, having educated in Delhi (India) and the United Kingdom selected a path of serving the rural poor in the field of dairying.

This publication entitled, "Resilience in Dairy Farming: A Success Story" comprises eight chapters covering the background, initial establishment, infrastructure and further strengthening, current production scenario and significant achievements, economic returns over investments, key factors to success, and the impact of work in dairy sector. I am sure, this Success Story would inspire other youth (including women) interested in embracing dairying as a respectable profession.

I congratulate both Nikki and Gaurav Chaudhary for their undertaking dairy farming as a successful enterprise.

A handwritten signature in blue ink, appearing to read 'RS Paroda', with a stylized flourish at the end.

RS Paroda

(Padma Bhushan Awardee)



Acronyms and Abbreviations

ABC	Animal Breeding Centre
APC	Agriculture Production Commissioner
CA	Conservation Agriculture
CAGR	Compound Annual Growth Rate
CoE	Centre of Excellence
DSR	Direct Seeded Rice
FAO	Food and Agriculture Organization
FICCI	Federation of Indian Chambers of Commerce & Industry
FPO	Farmer Producer Organization
FRI	Forest Research Institute
GCARD	Global Conference on Agricultural Research and Development
GFAR	Global Forum for Agricultural Research
GFFA	Global Forum for Food and Agriculture
GHG	Greenhouse Gas
HF Crosses	Holstein Friesian Crosses
IAFN	International Agri-food Network
ICAR	Indian Council of Agricultural Research
INR	Indian Rupees



IRRI	International Rice Research Institute
NDRI	National Dairy Research Institute
PSM	Private Sector Mechanism
PUM	Potentially Unwanted Modification
TFPO	Terai Farmer Producer Organization
UK	United Kingdom
UN-CFS	United Nations Committee on Food Security (UN-CFS)
USA	United States of America
WIMCO	Western India Match Company

Background



India is the world's largest milk producer with the total production amounting to 198.4 mt in 2019-20. Dairy is an important sector for India as it not only contributes significantly to Indian economy but also is a major contributor to farmers' income. Approximately 70 million farmers are directly involved in dairying. It is the largest commodity in terms of value. Total rupee value of milk produced per year at approximately INR 6 lakh crore exceeds that of all cereals (paddy, wheat and pulses) combined. Dairying is vital for Indian consumers who are largely dependent on milk and milk-based products to meet their protein and calcium requirements.

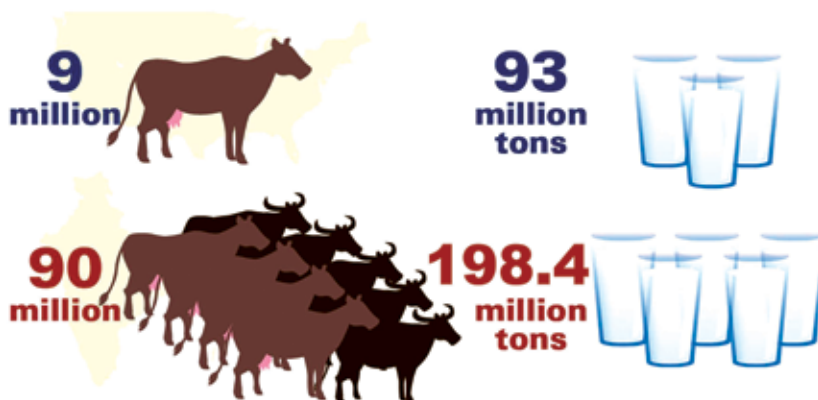
Despite being such an important sector for rural economy, farmers and consumers, dairy is unfortunately the most backward / undeveloped sector within agriculture. India's largest milk production globally comes from the fact that it also owns world's largest cattle population. The milk productivity per cow per year in India is extremely low – only 987 kg compared to global average of 2,200 kg. This low milk productivity per cattle translates to very high carbon footprint putting a very high environmental, economic and social cost on India. Currently, India produces mere 209.63 mt of milk from 90 million dairy while the US produces 93 million tons of milk from a a tenth of dairy bovine population (Fig. 1).

The journey of Nikki Pilia in agriculture started in 2011 when she got married to Mr Gaurav Chaudhary who is a third-generation farmer in the family. Upon completing his Post-graduation in Economics from Delhi School of Economics, Gaurav rejected the option of working in the promising Corporate World by opting to return to his family farm in the Village Tanda Vijaisi, Dist. Pilibhit (Uttar Pradesh).

His deep connect with agriculture since childhood and strong desire to contribute positively to agriculture and rural India brought him back to his roots in



MEETING INDIA'S MILK DEMAND



India has 10 times as many dairy-producing bovines as the U.S., but produces only 50 percent more milk. FAOSTAT (2014)

@2018 Global Agricultural Productivity Report

Fig. 1: Total milk production from dairy producing bovines in India vis-à-vis the US

2009. Nikki after meeting Gaurav was inspired by his decision and she too decided to engage herself full time into agriculture. Nikki is a postgraduate in Business Economics and Finance from the University of Surrey, United Kingdom and had been very good in academics throughout in School and University. Her upbringing took place in Gurugram and later she relocated to UK for her higher studies for about two years.

She had no exposure to agriculture until she married Gaurav and came to Pilibhit. Inspired by her parents teaching to her since her childhood to work in life with strong sense of purpose - she started engaging herself in farm activities from day one of marriage. She would go out and work in the sun for hours with workers at farm with major time going into backyard dairy comprising 6 cows. Her first project at the farm apart from monitoring backyard dairy on a daily basis was understanding and transplanting poplar tree.

She used to go with her husband at the Western India Match Company (WIMCO) Nursery in Baagwala, Rudrapur in Uttarakhand to purchase the most suitable varieties of poplar plants called 'Entire Transplants (ETPs)' which are one year old plants for planting in their fields and explored the best practices to transplant them so that in 6 years, the tree takes very good girth size, volume and height generating remunerative returns. Nikki and Gaurav transplanted about



4,000 poplar ETPs at farm in the first year and saw great vigor in trees within two to three years of establishment. Further, they planted sugarcane crop in poplar tree block plantation for first two years and from third year onwards started sowing wheat crop (Fig. 2) until the final harvest of poplar trees which they did when trees turned six years old.



Fig. 2: Two and half year-old poplar trees intercropped with wheat (2015)

The blocks of poplar attracted several farmers who were keen to learning about the package of practices for voluminous timber production. When Nikki went to purchase poplar transplants from WIMCO in 2011, Dr Ramesh Chand Dhiman, Ex-Managing Director, WIMCO Seedling Limited, Rudrapur asked Nikki to use her Economics background and do a detailed economic analysis of poplar based agroforestry *vis-à-vis* crops such as paddy- wheat rotation and sugarcane crop.

Nikki did comprehensive study on the same and in 2012 she was invited to present a paper on the economics of poplar *vis-à-vis* paddy-wheat rotation at the International Poplar Commission Conference held at Forest Research Institute, Dehradun. Her research paper was also published in ENVIS Forestry Bulletin. The efforts put by her in agroforestry gave her great deal of confidence as she could also help several farmers improve their income by enabling them improve timber yields by following the best package of practices. Gaurav handled farming and the crop inputs retail business in Pilibhit and had strong engagement with the farmers. Hence, it was easy to share the innovative package of practices for them with large number of farmers.

As Nikki used to sit at the backyard dairy at the family farm and watch the milking of cows, she became nostalgic and she remembers the days when she as a child had watched her *Nani* (Grandmother) milking 5 cows in the early morning in the village Mahipalpur, Delhi. Her *Nani* would get up at 4 am daily, gives cows the ration, fodder and then milk them. She used to make butter and butter milk in the wee hours when everyone else laid asleep. The taste of the milk was irresistible, and Nikki and her cousins would wait for their wholesome



glass of milk every evening. In the morning and afternoon, they used to have glass of buttermilk and the breakfast would comprise of *chapati* with super tasty *makkhan* (white butter). Nikki would always wait for school summer vacations to be at *Nani's* house and have super tasty beverages- milk and buttermilk. Back at her home in Gurugram, she would consume milk (heavily processed and packed) purchased from the shop- the taste and flavor of which was far from the real milk she consumed at her *Nani's* place.

The best thing she got from being back to backyard dairy was the super tasty milk she could consume again finally after several years. Her *Nani* sold cows when she became old and later passed away just a month before Nikki's marriage. Nikki's regret is that she could not share with her *Nani* the lost taste and flavor of milk she got again and her own journey in dairy farming.

After working for a few months at backyard dairy (Fig. 3), she realized that the surplus milk that the family was selling to milk cooperative fetched price that was lower than the cost of producing the milk. She started working to improve her knowledge of dairy farming. She used to read literature on cow management; talk to farmers and whatever little improvements she could make, she started implementing at their backyard dairy. Despite producing good quality milk with good fat, SNF content the bulk buyers failed to give a good price. The price of milk was very discouraging leaving very low returns at the end of the month.



Fig. 3: Nikki at backyard dairy in 2011

She insisted Gaurav to take her to nearby good dairy farms to gain deeper understanding of dairy farming. To her surprise, in the entire region, there was not a single commercial modern dairy farm from where they could get knowledge about dairy farming. As they explored dairy farming, they found that dairying largely operated as a subsistence activity and considered the most backward profession within agriculture. Even though there was huge investment accrued on the milk processing and marketing but there had been negligible investment/development on promoting efficient dairy farming.



This scenario made Nikki very disappointed, and she could just not understand that despite being such an important sector for India with milk and milk-based products carrying such a valuable place in every consumers' kitchen – yet the dairying was inefficient, ignored, backward with complete absence of know-how on producing raw milk sustainably and efficiently. Moreover, the dairy farmers failed to get fair price for the milk that is produced with lot of hard work. There exist negligible efficient modern dairy farms throughout India with a population of 1.41 billion people.

Nikki and Gaurav decided to go deeper into dairy farming activities. She used to sit on internet to learn about various aspects of cattle management- nutrition, breeding, disease management etc. She started travelling to dairy producers in Uttar Pradesh and Uttarakhand but the overall scenario was discouraging. She found out that various dairy seminars are being organized at the academic institutions for farmers. She participated and improved her knowledge base. At a Dairy Nutrition Conference at GB Pant University of Agriculture and Technology (GBPUA&T) Pantnagar in Uttarakhand in 2012, she met several key people involved in various areas of dairy sector, also cattle feed owners, cattle nutritionists, veterinarians, and farmers. Upon sharing her interest in dairy farm, almost everyone recommended her not to take-up dairy farming as it would not fetch any good return.

Nikki shared her experience at the Conference with Gaurav, and both realized about serious problems the dairy sector was facing and hence with stronger commitment both decided to take up the challenge themselves and solve the problems. They forayed into commercial dairy farming in 2014 with the aim to dedicate their lives for the development and upliftment of the very backward but utmost important sector- dairy farming.

Initial Establishment



Nikki travelled to Ludhiana in 2012 and 2013 to learn about modern dairying at Progressive Dairy Farmers Association Fair which is usually held in the month of December every year for 3 days. Dairy Farming is well developed and quite prosperous in the state of Punjab unlike any other place in India where dairy is largely under-developed. She observed various machinery at the fair- cow milking parlor, bulk milk coolers, and vending machines and learnt about silage making and importance of having right crossbred (HF Cross) cows having a right balance of exotic and indigenous blood.

She went through various fodder stalls and attended the cattle show where the best performer in terms of highest milk production would win and farmer was awarded and felicitated often with monetary rewards. She hoped to see the similar prosperity in her state Uttar Pradesh and the one option was by being herself the initiator. But being three years in dairy, she had also realized that the journey ahead is going to be very tough, nonetheless she returned to Pilibhit and started implementing all that she had learnt in Ludhiana, at their own farm.

Gaurav had always encouraged Nikki to continue her efforts in dairy and despite every hurdle and challenge they kept on working in learning and growing dairy. After doing quite a lot of research, they finally started the construction of 'modern dairy shed' at their farm in 2014, with capacity to accommodate up to a total of 70 heads including cows, calves and heifers (Fig. 4,5). It was based on the concept of open housing to provide maximum comfort to cows and free roaming space. The segregation was done in the shed to keep cows separately as per their days in lactation. Calves and growing heifers had different compartments. This was done for the ease of management and giving optimal nutrition as per the age group and stage of lactation.



Once the shed got constructed, the next most challenging part was to purchase the right cows for the dairy. Since the dairy farming was not progressive in Uttar Pradesh, finding cows with good genetic potential was very tough. So, they had to go to Karnal (Haryana) to find out well-bred cows. Due to meager experience in dairy, cow purchase was becoming difficult



Fig. 4: Nikki and Gaurav welcoming newly arrived cows in the newly constructed shed (2014)

for them as they lacked the required know - how on good cow identification. They immediately started researching on good cow traits and characteristics and based on that, they started evaluating cows. Initially they went to few cattle traders who promised to get them good cows, however, Nikki was very dissatisfied with the



Fig. 5: Dairy shed accommodating around 30 heads (2016)

kind of cows that were shown, and the exorbitant price being charged for the cows that didn't seem to be of good genetic makeup. After spending a few days with traders, she decided to start visiting dairy farms by themselves and buy directly from the farmers. Nikki was very thankful to God that she took this decision. They visited a few dairy farmers and as

they expected the farmers would show the milking of cows both in morning and evening and tell them with full honesty every detail about the cow. The first lot that they purchased was 7 cows from two different dairy farmers in Karnal which arrived at Pilibhit farm through the hired truck. Nikki travelled along to the farm and was anxious about the travel stress of cows covering huge distance. She however had ensured that enough fodder and water was inside the truck for cows and that they could sit and rest comfortably on sandy soil that was filled inside the truck.



The first arrival was good enough and all the cows reached safely. It was done towards 2014 end when Nikki was also expecting her first child. As a new mother, the first few months were very demanding on both the fronts which was very tiring also. Both the child and the cows needed good care and nurturing. Compromise on any one was not possible and that left her no free time at all for three to four years.

The fodder was already grown at the farm and the shed was ready to accommodate the newly purchased cows. Next several visits and loading of cows happened from Karnal, Kurukshetra over a few months and the cows travelled all the way to Pilibhit. About 30 heads which include cows, calves and heifers were purchased and transported safely to Pilibhit with no casualty. The purchase of cows had taken place throughout 2015 with 6 to 7 cows purchased at a time. Fortunately, all the cows performed as expected and Nikki's work multiplied as she now had to manage a herd size of 30 heads.

The total milk production ranged from 200 to 300 litres per day in the year 2016-17. Cow purchases were done in the months of March, April and then in November, and December. May, June and July were avoided as these are hot months and long travel of cows can lead to additional heat stress and casualties.

The milking was done in frugally constructed milk parlor area having Vansun milk parlor that milked 6 cows at a time (Fig. 6). While Nikki got fully engaged in managing these cows – she had no time to market her high-quality farm fresh milk. To focus on milk production and continue her learning about cattle management she continued to sell the milk to other bulk buyers in Uttar Pradesh at lesser price that kept the revenues on lower side for quite long.



Fig. 6: Six cow milking parlor unit at Chaudhary Farm

The period was tough but with strong positive attitude, hope for better dairy future and her clarity to dedicate her life to transforming dairy farming, she with the help of Gaurav took every challenge as an opportunity and continued efforts tirelessly to improve her knowledge on dairy farming/ efficient raw milk production. For them the entire work in dairy revolved around efficient raw milk production focusing on keeping the production cost minimal.

Infrastructure and Further Strengthening



Improving dairy farming and making raw milk production highly efficient was the sole aim of Nikki to which she stayed committed for several years and till date the focus remains on gaining insights on continual improvements in dairy farming. After doing months of research – Nikki and Gaurav had designed and constructed the dairy shed in 2014 that could maximize cow comfort. The shed was carefully divided as per the age and lactation stage of the cows. This is done to ensure balanced ration and nutrition for all as per the requirement.

The first important step she took as soon as she had HF cross cows at her farm, was to have semen of well-bred bulls. For that the pre-requisite was to have a 'Liquid Nitrogen Container' in which the semen straws could be maintained at their dairy farm. She purchased TA-50, BA-35 and BA-3 containers from Lucknow that could keep semen straws intact.

Just after the purchase, Gaurav took her to Animal Breeding Centre (ABC) at Salon and Raebareli in the year 2014 which is a Semen station in Uttar Pradesh maintaining semen of well-bred bulls. Nikki was glad to be there. She purchased semen of very famous bull that time- HF-168 known for giving she-heifers that gave good milk yield. She also purchased Jersey semen and HF – Sahiwal cross semen. Both used to visit ABC Salon regularly to purchase semen of good bulls (Fig. 7). Nikki was also shown semen motility by the ABC semen station before the final sales. At that moment, she realized the importance of having good motility without which cows would not conceive. She came back to farm very excited and started those first steps towards breed improvement which is one of the 3 essential pillars for having an efficient dairy farm.



Fig. 7: Screen displaying semen motility at Animal Breeding Centre, Salon Lab- 2021

All the commercially viable dairy farms in Punjab and Karnal, she had seen, had HF cross cows. A few farms also had good jersey crosses. Most probably, not many efforts were made on breeding and improvement of indigenous cattle as she had not seen any pure indigenous cow commercial dairy farm in numerous trips she had made to Punjab and Haryana.

As the cows at her farm started coming in heat, the insemination got done through local veterinarian using the semen she had purchased from ABC Salon. She had to ensure that enough nitrogen was maintained at the farm in the TA-50 container as without which the semen would deteriorate. The first year was challenging in procurement of liquid nitrogen, she had to either go to Moradabad or far off semen stations. Soon, she got support from the Animal Husbandry Department, Pilibhit promising her monthly supply of nitrogen to her farm. It has been seven years now and they have been supplying liquid nitrogen every month.

Within three to four years of the cattle purchase from Haryana, their dairy farm – Chaudhary Farms Dairy and Breeding (renamed as Mango Dairies in 2021) had become well known in the region with healthy and good milking HF cross cows.

The situation reversed and in 2018, farmers from Karnal (Haryana) visited their farm and purchased 6 cows at very good price. This had hardly happened before that the progressive farmers of Haryana came to Uttar Pradesh for cattle purchase (Fig. 8). This boosted Nikki's and Gaurav's confidence as they could rear and raise very



Fig. 8. Sale of well-bred heifers to Karnal, Haryana



good cows at the farm. Their breeding outcomes were good and earned tremendous reputation not only in their region but in states of Haryana and Punjab.

One very important learning lesson for her in cattle breeding was that as the HF cross were bred in a way to have a higher percentage of HF blood, the results were not very favorable as higher purity HF cows would lose their resilience to fight heat stress and diseases and reproductive capabilities were affected adversely. Same was true if breeding to attain more of indigenous blood was done in any HF cross as the milk productivity capabilities were reduced. Hence, it was very important to have a very balanced breeding strategy to attain success and efficiency in dairy farming.

Meanwhile in 2016, Nikki was one amongst the top 6 agripreneurs selected worldwide out of 426 agricultural proposals submitted to Global Conference for Agriculture Research and Development (GCARD-3). Her proposal was to study and learn about Indigenous milk breeds, namely, *Gir* and *Jaffrabadi* which she had heard were performing very well in Brazil. She got small 'seed fund' from Global Forum for Agricultural Research (GFAR) and was invited to South Africa in 2016 (Fig.9).



Fig. 9: Nikki participated in the Global Conference for Agricultural Research and Development (GCARD-3) at Johannesburg, South Africa (2016)

Nikki travelled to Bhavnagar and Kodinar and explored *Gir* cows in Gujarat. She was also amazed to see *Jaffrabadi* buffaloes which are world's heaviest buffaloes. She met Mr. Pradeep SinhRaol in Bhavnagar who is the top breeder of *Jaffrabadi* buffaloes and *Gir* cows and purchased two *Jaffrabadi* heifers from him (Fig.10)

The *Gir* cows and *Jaffrabadi* reached from Gujarat to her farm in more than two days through truck. While she did good purchase of *Jaffrabadi* from a reputed farmer, but her *Gir* cow purchase was done without much attention and hence



Fig. 10: Jaffrabadi buffalo purchased from Bhavnagar, Gujarat (2015)

happy when visitors get really attracted towards the grand size of the buffalo at her farm. It is hence very important to never lose attention when purchasing animals. Every important detail must be examined before farmer makes final purchase of cow/ buffalo. Wrong purchases of cattle have led to closure of several farms in Uttar Pradesh and hence Nikki always cautions farmers to be very attentive and careful while purchasing animals.

During the visit to Johannesburg, South Africa as a young dairy farmer, Nikki met a few key people who have been her mentors and motivators in the journey so far. She met Peter Casier who trained her along with team of agripreneurs on making use of social media platforms to disseminate information and to grow business. The trainings were inspiring and back home, she made her 'Dairy Facebook page- Chaudhary Farms Dairy and Breeding' which she renamed as 'Mango Dairies' in 2021. The Facebook page is widely followed, and Nikki has been sharing key activities and good information on dairy regularly on the page.



the *Gir* breeds that landed up at the farm were low performers with poor reproductive capabilities.

The *Jaffrabadi* buffalo purchased has already given three births till date. This breed gives up to 15 liters of milk per day in her peak months and is very resilient to both disease and climate with great reproductive capabilities. The buffalo has given birth to two female and one male calf (Fig. 11). All of them are very healthy and showed very good growth. Nikki regrets her *Gir* purchase but her *Jaffrabadi* purchase has been very successful, and she feels very



Fig. 11: Well-bred Jaffrabadi heifer raised at Mango Dairies, Pilibhit (2021)



Nikki met Anne Roulin who was the donor of the 'Seed Fund' to carry research on Indigenous Breeds—*Gir* and *Jaffarabadi*. Anne has been encouraging Nikki since 2016 in her tough moments to just keep going and continue her strong desire to bring change in the dairy farming scenario. She has been walking the journey with Gaurav no matter how tough the road got and the mentors and small kind gestures coming in their way for their efforts in the rural India have played an important role in their journey that kept them going through the struggling period.

Further, 2018, Nikki was invited as a young agripreneur to Saskatoon, Canada by Global Institute for Food Security to give a presentation on her work in dairy farming at the 'Emerging Technologies for Food Security Conference'. In between, she gave birth to her second child in 2017 who was just few months old when she left for Canada. Nikki didn't want to miss the opportunity to present the dairy scenario in India which needed lot of attention and so she without any doubt confirmed her participation as a keynote speaker from India (Fig. 12).



Fig. 12: Nikki made a presentation on the scenario of dairy farming In India at Emerging Technologies for Food Security Conference held at Saskatoon, Canada (2018)

The presentation got appreciation as the work truly had strong potential to benefit dairy farmers, consumers and environmentlists in India. She shared her key insights into efficient raw milk production and the fact that dairy farming needs investment flow to bring the requisite improvements in lives and livelihoods of dairy producers, quality of milk available to consumers and the overall environment which currently is being adversely affected due to very high carbon footprint per liter of milk produced in India as dairy farming currently is in bad shape.

Neglecting dairy farming at country level will not only deprive its people of high-quality milk and milk products but farmers themselves will continue to remain trapped in poverty. Additionally, high greenhouse gas (GHG) emissions per liter of milk produced need very serious attention as this makes our dairy farming highly unsustainable. Nikki met Anne at Canada and shared her plans for



Fig. 13: Nikki first from the left and Anne Roulin as a moderator at the Emerging Technologies for Food Security Conference held at Saskatoon, Canada 2018

dairy expansion in her region (Fig. 13). Anne encouraged Nikki to document her plans and vision for dairy and share with her. In Canada, she also visited the Rayner Dairy farm at the University of Saskatchewan, Saskatoon which promotes entrepreneurship in dairy (Fig. 14).

After returning to India from Canada Conference, Nikki as advised by Anne, started taking down notes on her vision

for dairy along with Gaurav and how they would also work with the dairy producers in the region who were not able to grow because of lack of knowledge as well as poor access to market that could fetch them fair price. Nikki comes from a family which has never been involved in business. She herself never had imagined of being an entrepreneur but the strong purpose and desire to change the dairy scenario was the crucial factor building her up as an entrepreneur on daily basis.



Fig. 14: Nikki's visit to Rayner Dairy unit at the University of Saskatchewan, Saskatoon, Canada

She would spend hours in dairy to improve upon breeding, feeding of cows and strived to bring continual improvement in milk quality. Since, third day of her marriage she had never worried about the hours of exposure in the sun in severe hot months of May, June and July. She would be in shed and think about protecting cows from heat stress and for managing fodder, feed and rumen of the cows that would maintain milk quantity and quality.



She sometimes recalls and smiles remembering how her family, relatives and nearby farmers were amazed to see the severe tan on the face of a newly-wed girl and would often ask her what was the need to get involved in work and that she should rather be enjoying at least for few months as a newly-wed before taking up this demanding work.

In the hot months of May, June and July, milk production of HF cows drops but if the breeds are balanced HF- crosses having about 30 per cent *Bos indicus* / indigenous blood the impact of heat stress is much less. As we move towards purer HF cows, the hot months become challenging for these cows and there is heavy drop in milk production and also there are problems of conception. Therefore, it is vital that appropriate HF cross breeds are maintained at dairy farms.

Nikki went to ICAR-National Dairy Research Institute, Karnal and purchased Sahiwal semen from there and started doing backward breeding of HF cows that had moved towards purer HF traits as she had been making the crosses with 100 per cent HF bulls for the last few years and now had very less percentage of indigenous blood. These so-called pure HFs were inseminated with Sahiwal semen or HF- Sahiwal crosses and today her farm has good number of very balanced HF cross breeds that are heat resilient as well as maintain good milk yield throughout the year.

The breeding performance of the dairy farm is good, and her first few years had major focus on cattle breeding. Besides purchasing semen from the organizations having good animal genetic potential, she has put efforts to have good animal conception rates and on having a calf every year from a cow.

Apart from cow breeding – the other key parameter for efficient raw milk production is cow nutrition. With a good understanding of balanced and healthy cattle, nutrition is vital for having a successful dairy farm. However, it is also very important to optimise the costs and they have done lot of trials, experiments, and innovations in all these years to have that cost optimized nutrition available for cows.

Current Production Scenario and Significant Achievements



Nikki's dairy farm is currently one of the most efficient dairy farms in the region and in the state of Uttar Pradesh (Fig. 15). The farm size is medium with the total production ranging between 300 liters to 400 liters of milk per day from a herd size of around 20 to 30 cows. The average milk yield per cow per day of the farm is between 15 to 20 liters.



Fig. 15: 'Mango Dairies Farm' and creamery set-up in village Tanda Vijaisi, Pilibhit, Uttar Pradesh (2021)

The dairy farm acts as a model dairy farm for several farmers who keep coming to learn about efficient raw milk production and for purchase of cattle, semen straws and sometimes cattle feed and fodder. The undeterred focus on making dairy farming efficient is one of the key reasons that they have been able to strengthen the three pillars of efficient raw milk production, namely, breeding, nutrition and cow comfort. These three pillars look simple to work upon initially but after having worked for several years in dairy both very well understood as to how much scope of improvement lies in all these three if we talk about current Indian dairy farming.

Nikki observed several dairy farms in Uttar Pradesh collapsing not so much because of mere poor access to markets but more often because of poorer cattle breeds, inability to give proper nutrition to the cows, cost effectiveness, disease outbreak at farms due to poor hygiene, delayed or missed deworming/ vaccination



programs, etc. and delayed veterinary interventions. At her own farm, initially there were several challenges she had to overcome but because she was fully engaged into dairy hence, she could sustain and grow the farm even at very little profits. Gaurav had particularly taken complete charge of managing cow nutrition while Nikki's focus was on cattle breeding. Cattle nutrition is not only important to ensure good health of cows and good milk yield but is also the major cost component of dairy farming. Hence, it is very important to optimize nutrition cost which comes from right fodder- feed balancing.

At her dairy farm, cow nutrition revolves around maximizing fodder-based nutrition as relying more on concentrate feed which is very costly. About 70-80 per cent nutrition is covered by feeding forages to cows at 'Mango Dairies'. The most commonly fed fodders to cows in the region were *chari* (sorghum) in summers and *barseem* during winters. She also initially fed these fodders to the cows, but later felt the need to further explore and find more suitable and nutritive fodders. In the first two years of cattle purchase and due to her limited knowledge on cow nutrition, she incurred very heavy costs on cow nutrition as she was purchasing and relying more on cattle feed for her cows. Average quality of fodders were fed and often there was lack of continuous availability of these fodders. Since the feed cost is the costliest component under nutrition, the emphasis was given on feeding cows good quality forages with very less reliance on grain mix/ cattle feed.

At their family farm, they planted poplar trees in blocks having sufficient spacing to take winter crop underneath. In 2016, they started growing fodder oats underneath poplar plantation which grew very well and gave good yield. In 2018, they found about the rye grass fodder also called *Makkhan* grass with



Fig. 16: Poplar tree and rye grass fodder integration at 'Mango Dairies'

good protein content and considerable yield per acre of land, and much better than *barseem* in terms of its nutritive value, dry matter content and yield. Its hay is very good fodder for growing calves and heifers. Its silage also is very tasty and if made properly, can be used to feed the cows in summers. Also, it grows very well under the poplar trees (Fig. 16). The



good yields of excellent fodder rye grass made them very happy as this proved a successful trial. Taking fodder under poplar trees saves the area under pure fodder cultivation. Poplar trees are harvested in 6 years and until then winter fodders can be easily grown underneath the trees. Farmers quickly adopted this practice.

As their knowledge on cow nutrition, cow comfort and cow breeding improved, they witnessed improvement in milk productivity per cow per day (Table 1). In summers, maintaining and continuously feeding nutritive fodders is usually not possible without good prior planning. *Chari* is the most common fodder fed to cows in the region and there is usually a gap in the feeding of green fodder for several months. *Chari* is also not very nutritive and there are better fodder options available.

Table 1: Average milk productivity per cow per day and annual milk production at Nikki's Dairy Farm (2015-2021)

Year	No. of milch cows	Average milk production per cow per day (litres)	Annual milk production (litres)	Increase in annual milk production (litres)
2015	15	10	54,750	-
2016	20	12	87,600	32,850
2017	30	12	131,400	43,800
2018	26	15	142,350	10,950
2019	30	15	164,250	21,900
2020	30	17	186,150	21,900
2021	32	17	198,560	12,410

Green fodder is not fed to cows continuously and for several months farmers often feed the cattle with just wheat straw and concentrate. Sometimes unnecessary products as marketed by few companies that add to their production costs. This is not healthy at all for the well-being of the cows, also it eventually brings losses into dairy as the concentrate cost is quite high and there is depletion of essential nutrients from the cow's body. Cows do not get the essential protein, energy and vital macro and micro minerals that a good green fodder can give. As a result, there are reproductive issues, poor milk yield and other diseases emerging in cows.



To ensure continuous supply of nutritive forages and reduce dependence on the purchase of costly concentrate mix, they started growing and managing fodders- maize, brown mid rib (BMR) sorghum, sugarcane and rye grass that would take care of cows for full 365 days and significantly reduced their cow nutrition costs and at the same time ensured good nutrition to cattle.

Fodder Cycle for Ensuring Year Round Supply of Forages

The family farm where they reside and run dairy is called by the name of 'Chaudhary Farms' (new Mango Dairies). It is a 75-acre farm where various crops are grown, and crop rotation is followed. Fodders are grown here in rotation with other crops and give very good yields. Rye grass sowing is done in the second/ third week of October and crop continue giving fodder till mid-April and during this period it is harvested 5-6 times and fed as green cut to the cattle. Rye grass silage is also prepared for feeding in hot months when rye grass crop is not available. Ryegrass mixed with maize silage provides a good protein – energy combination.

Hadu berseem is also sown in October as it is better than the common *berseem* giving two to three cuts extra lasting up to 1st week of June. Chicory fodder and fodder oats are also sown in October. Chicory starts giving cuts in February and gives very high yields in the summer months of April, May and June. With very high crude protein percentage, chicory fodder helps in achieving good milk yields during months of April, May and June. The significance of fodder oats is that in the extreme winter month of January while other winter fodders are still short, oats takes very good growth giving sufficient fodder yields for cows. They are now actively sowing a mix of ryegrass, *Hadu berseem* and oats on same plot as mixed crop forage. Maize (for silage) crop is sown in February or early March. It is a 90-day crop. It is harvested and ensiled in May/June. Sweet sorghum and common sorghum mix is sown for green cut feeding immediately after rye grass fields are cleared in April. They have also identified brown mid-rib (BMR) sorghum which has high digestibility as compared to common sorghum. Their expertise in fodder crops is the key to successful dairy operation.

Efficient Cow Nutrition

Cost-efficient nutrition revolves around the maximization of fodder-based nutrition. They are now regularly achieving high yields in production of following fodder crops:



Rye grass gives 120 quintals per acre per cut and 5/6 cuts from mid-November to April. Hence, occupying land under rye grass from October to April – 7 months give a dry matter of 100 q/acre with 15 – 18 per cent crude protein. A lot of rye grass fodder is grown underneath poplar trees. For high yields of rye grass crop, homogeneous placement of seed and uniform germination is very important. Maize for silage is a 90-day crop of maize gives about 200 q/acre fodder yield. Sowing time is February-March and harvest time is May-June. Hence, occupying land under maize crop from February to May (4 months) gives a dry matter yield of 60 q/ acre. Selection of right maize hybrid is important to achieve such high yields. A number of 45,000 active plants per acre have given the maximum yield. Good agronomic practices allow achieving canopy cover as soon as possible. They maximize maize production per acre by correct seed rate, right hybrid selection, balanced nutrition, good establishment of crop (good germination and early vigour), weed management, right irrigation practices with special focus on critical periods. Sweet sorghum + sorghum mix gives 300 q/acre in the first cut and 200 q/acre in second cut and is very good for green cut. Single cut for silage at 120 days is also a good option and gives above 300/acre silage yield. Thus, the total dry matter yield per acre per year obtained from these fodders is 180 - 200 quintals. They also make rye grass hay during March and April which is fed to growing heifers during summer months.



Fig. 17: Visit of Duncan Williams a young Nuffield Scholar from United Kingdom at Nikki's dairy farm in 2020

Nikki met Duncan Williams a young Nuffield Scholar from United Kingdom at the



Fig. 18: Spring corn for silage at Nikki's dairy farm

Food and Agriculture Organization Headquarters, Rome in 2019 and invited him to visit her dairy farm. Subsequently, Duncan Williams visited Nikki's dairy farm in the year 2020 to learn about Indian Dairy Farming scenario. He appreciated the good growth of rye grass at the farm (Fig. 17). The performance of spring corn for silage was also very good (Fig. 18).



Maximizing the Efficiency of Concentrate Mix

Cost of concentrate mix is the largest component in the cost of milk production. It accounts for one-third of cost of milk production (in India). Generating efficiency in this component is very important. She initially had very high cost of production of milk due to over dependence on concentrate feed. The fodder quality and cycles were not good. They gave several years to gain expertise in feeding high quality but cost-effective nutrition to cows.

Cow Comfort for Profitable Dairy Operation

Understanding and implementing concepts of cow comfort is of prime importance. In Indian context, cow comfort mainly involves three aspects – cow bedding, cow cooling and cow spacing. It is important to keep cows in well-ventilated shed and maintain cleanliness and hygiene. In hot months of May and June, cow cooling becomes important which can be done by bathing cows minimum two to three times. This reduces the heat stress and ensures that cows eat properly. Regular tick sprays must be done in the cattle shed to prevent tick borne diseases. The shed should not be cluttered, and it is good if they are also given some free roaming space to move around. This ensures better udder, hoof health and overall. Cows should be given fodder and feed ad-libitum so that they eat as per their need. Clean water should be available 24 × 7 in water troughs.



Fig. 19: Maximizing cow comfort for efficient raw milk production

Breeding Efficiency

Right from the start of the dairy farm, Nikki never compromised on breeding. She had in-depth knowledge right in early stage and she understood that the dairy farming success would depend a lot on having a very balanced and appropriate cross of HF-indigenous and also with good buffalo breeds. She spent considerable time for cattle purchases in Haryana and ensured that only the most suitable and well-bred dairy animals are purchased.



Also, they were quick in purchasing the 'Semen containers' so that they could store the semen of well-bred bulls of cows and buffaloes and do insemination timely and develop well-balanced cross breeds. Today, their dairy farm is the most reputable and trusted dairy farm of Uttar Pradesh with very good cows and buffaloes. It is so good that the farmers from Haryana from where they once purchased cows, came all the way to their farm in Uttar Pradesh to purchase the cows.

They have been successful at carefully choosing bulls best suited for genetic upgradation of existing cows. Different cows need different bulls based on which traits are to be improved. They are still striving for careful crossbreeding. Balanced nutrition and comforts have led to good breeding rate in the herd. They also visited Animal Breeding Centre, Salon, and Uttar Pradesh



Fig. 20: Gaurav and Nikki at Animal Breeding Centre, Salon

to understand different methods of breeding for improving the breeds of cattle (Fig. 20).

Manure Management

Along with producing biogas as a fuel, we should be able to use manure most effectively in improving the productivity of our fodder crops as part of our manure management strategy. They made very good use of manure as a fertilizer in the fodder fields which significantly reduced their dependency on purchase of fertilizers from outside.

Recognition of Efforts in Dairy Farming

Nikki has been invited thrice by the Food and Agriculture Organization of the United Nations (FAO), Rome, Italy as a key speaker and a young agripreneur (Fig. 21, 22). Her efforts as a young, educated female in dairy farming in rural India has been well recognized and she has been asked to speak about the situation of dairy sector in India and her own work and vision to transform dairying. She is also the member of Committee on World Food Security where she often expresses her views as an agripreneur (Fig. 23) on need of all stakeholders to work together to making



Fig. 21. Keynote address by Nikki at Food and Agriculture Organisation Headquarters, Rome (2018)



Fig. 22: Nikki at Food and Agriculture Organisation Headquarters, Rome, Italy, 2019

agriculture in general and dairy in particular - sustainable, efficient and viable which is the need of the hour in order to improve livelihoods of dairy producers, mitigate the adverse impacts of climate change and for the health and wellbeing of consumers for whom milk based protein is vital. She is also the Board Member of the Youth Alliance for Zero Hunger at the United Nations (UN). The aim of the body is to bring the



Fig. 23: Nikki invited as a young dairy farmer to speak on "Growing Young-agripreneur" at Committee on World Food Security-46, FAO, Rome in 2019



Fig. 24: Nikki first from the left at Global Forum for Food and Agriculture-2020, Berlin, Germany

voice of the youth involved in agriculture at the Rome based agencies.

Nikki was also invited to speak as Expert Panel at the Global Forum for Food and Agriculture (GFFA) 2020, Berlin organised by German Federal Ministry of Food and Agriculture (Fig. 24). At every



forum, Nikki emphasized the serious attention that needs to be given to Dairy Farming in India by all the stakeholders for its development.

She was also invited as an agripreneur to make a key note presentation in the Regional Conference on 'Motivating and Attracting Youth in Agriculture (MAYA)' organized at New Delhi on 30-31 August 2018 (Fig. 25), also by the Trust for



Fig. 25: Nikki with Dr RS Paroda and other participants during the Regional Conference on Motivating and Attracting Youth to Agriculture (MAYA) at New Delhi

Advancement of Agricultural Sciences (TAAS) to participate as a young women farmer in the "National Dialogue on Innovative Extension: A Way Forward" organized by the TAAS in New Delhi during 2022.

Advisory Support from the PUM Netherlands Senior Dairy Experts

Nikki had met Ambassador Hans Hoogeveen at the FAO Headquarters in Rome who listened with interest her journey in dairy farming in India that she presented as a keynote speaker at the International Symposium on Agriculture Innovations for Family Farmers held in October 2018. He was very much impressed for her deep commitment in the tough sector but at the same time, he also realised listening to her as to how much alarming was the dairy situation in India and the kind of work that needs to be done on ground in the sector. She wrote again to Hans Hoogeveen in 2021 and asked if any kind of collaboration with dairy entrepreneurs from the Netherlands is possible for the dairy expansion in her region to which he promptly acted and asked the Dutch Embassy in India to consider options of working with Nikki. She got the chance to speak with the Dutch Agricultural Counsellor and the team very quickly asked their Not-for-profit organisation called 'PUM' to give expert dairy guidance to her so that she could build upon a 'Centre of Excellence on Dairying' in Uttar Pradesh.

In August 2021, PUM senior expert Mr Tjeerd who is actually a dairy farmer from the Netherlands started mentoring Nikki on dairy farming and the coachings were very helpful as she realised that there were still lot of gaps that needs to be



attended so that she could work easily and improve the dairy farm efficiency. She feels fortunate in getting guidance from the dairy farmers of the Netherlands who follow the best dairy practises and the most sustainable farming methods. The PUM senior experts had been guiding Nikki very closely on every aspect of dairying-breeding, nutrition and dairy processing which will further be disseminated by her to the dairy farmers in Uttar Pradesh, India.

The entire team at the Dutch Embassy comprising Agricultural Counsellor- Michiel van Erkel, Honorary Consulate at Lucknow Mr Sharad Thadani were quick to help in her endeavours by connecting with the PUM senior experts team comprising of Leon Husson, Hein Willem Leeraar and PUM Indian Representative Tarannum (Fig. 26). She was thankful to them as such collaboration and cooperation has the potential to make huge difference at the social, economic, and environmental level at a time when the world is becoming food insecure and facing the threats posed by climate change.



Fig. 26: Nikki with Mr Sharad Thadani and her FPO team at the Consulate of the Kingdom of the Netherlands, at Lucknow in November 2021

Nikki was invited to be part of the Delegation of Ambassador of Netherlands to meet the Hon'ble Chief Minister Shri Yogi Adityanath Ji, and Chief Secretary and Agriculture Production Commissioner. She could put forward her views on



Fig. 27: Nikki – First from left with Hon'ble CM Yogi Aditya Nath Ji, Dutch Ambassador Martin and Agricultural Counsellor Michiel van Erkel

setting up a farmer, 'Collective Milk Processing Unit' and a 'Dairy Training Centre' in these meetings (Fig. 27). She is often invited as a young agripreneur to share her experiences as a speaker at various platforms including conferences, group discussions, radio broadcasts, etc. (Fig. 28).



Fig. 28: Nikki as a speaker to share her experience in dairy farming

Addition of Buffaloes at the Dairy Farm

Nikki's experience with *jaffrabadi* buffaloes had been very good. She found that buffaloes are very resilient and much easier to manage compared to cows. She strongly believes that having buffaloes at the dairy farms adds to profitability and hence must be promoted (Fig. 29). For smallholder farmers buffaloes are the best option.



Fig. 29: Promoting buffaloes at dairy farms

Nikki introduced 15 buffaloes at her dairy farm on 1 Jan, 2022 and will now develop expertise in buffalo rearing and farming. She truly believes in the strength and the resilience of buffaloes, and the expertise would also enable her better to serve the buffalo milk producers in the region.

Value Addition and Marketing

Dairy farming is very complex, and it involves lot of time and efforts. Any gap on any front can lead to severe losses and hence her concern when she purchased the costly Hf cows from far off places was to be able to take good care of them. She continued to sell the milk at low price as dairy management being new as well as



complex and needed much deeper engagement. Lack of focus on understanding and executing pillars of efficient dairy farming would have led to the adverse outcomes. Though sustaining very low returns for three to four years was not at all easy especially against the time and efforts that went into operating the farm. However, their strong will to change the dairy scenario kept them positive and committed to the cause.

In mid-2017, Nikki installed 'Bulk Milk Cooler' at one of their agri-inputs retail location in the Pilibhit city. The city is about 20 kms from their village / dairy farm and the raw milk was sold to the consumers from the centre. The 'door-to-door' delivery was also started. Customers liked the taste and flavor of the milk. Soon she made available the farm fresh cottage cheese/ paneer to customers who complemented their paneer and often expressed that they had never eaten such a tasty paneer ever in their life. The demand of milk for their brand is increasing in Pilibhit city from individuals as well as institutional buyers. They are exploring all possible opportunities with the Government to see how they can work towards dairy development in the region in a big way and expand the milk production at their farms and with their partners with whom they intend to work in a way that leads to creation of a thriving community of milk producers as well as establishment of the sustainable dairy practices.

Currently, the dairy farm sells high quality farm fresh raw milk and paneer, but the future plans are to further expand the dairy project and work together with the dairy producers and launch 'Farm fresh milk brand'. Their dream is to see farmer producers, the drivers and entrepreneurs of the company coming together to launch a truly farmer owned brand that build a thriving community of farmers bringing out the highest quality milk and milk products for the consumers.

All these years' efforts were directed towards developing deep knowledge base on producing raw milk efficiently and the next phase would be focusing on building a farmer-owned milk brand, bringing out the beverage that is produced with huge efforts by dairy producers. The dairy farmers will get the value-chain profits realized from milk sales and marketing. They will be engaged and involved as the shareholders in the company and not just treated as mere vendors of the milk which is unfortunately the scenario throughout India.

Other Significant Achievements

Livestock-crop-tree integration

Tree – Forage Carbon Sink captures heavy quantities of atmospheric CO₂ and sequesters it in soil. It provides a model for large scale tree planting on



Fig. 30: Poplar tree and winter fodder integration

circular systems, cow breeding, etc. are developed (Fig. 30). The farm has put in full efforts to take best possible yields of fodders such as rye grass, chicory and oats beneath the poplar plantations. It is continually working towards finding systems that make dairying sustainable and viable.

Circular systems approach

Circular systems approach is at the centre of the 'Mango Dairies' work. Gaurav is the farmer in the team always coming up with the innovative practices that can lead to cost-efficient and sustainable solutions. Paddy straw burning has been a major issue in Punjab, Haryana and Uttar Pradesh. The Government of Uttar Pradesh has in fact banned the burning of paddy straw recently. In 2020, they started their work on ensiling paddy straw by carefully treating it with the molasses and other ingredients. In 2021, full scale incorporation in heifer feeding was achieved with good results. Paddy straw silage is good for the heifers and dry cows. Adding paddy straw silage in the feeding portfolio results in major cost reduction and it has the potential to play a big role in animal husbandry in India (Fig 31). The manure produced by the cows goes to forage crops fields giving them bumper yields further resulting in high milk yields.



Fig. 31: Group of 15 heifers being raised on paddy straw silage as main diet



Promoting conservation agricultural practices

Both have been deeply involved in rural India for more than ten years now with the clear aim to contribute significantly to the rural agriculture, dairy and farming community. They have been making all out efforts to bring the maximum possible improvement in all the above areas. Apart from actively promoting best package of practices amongst the farmers on having high volume timber from the agroforestry tree poplar, they have also adopted Direct Seeded Rice (DSR) and 'Zero Till' practices which are being promoted in the region (Fig. 32, 33).



Fig. 32: Direct seeded rice cultivation



Fig. 33: Zero tillage practice in wheat

These sustainable agricultural practices of shifting from the puddled transplanted rice to dry seeded rice and from conventional tillage wheat to minimal/zero tillage wheat not only aids in cost savings and yield enhancement but also prevents tremendous quantity of water from being wasted, improving soil texture and saving of other resources such as diesel, etc. contributing to reduced carbon emissions and in keeping air healthy. Several farmers have already benefitted from these sustainable agricultural practices tremendously. Nikki also wrote a blog on the need to implement conservation agriculture (CA) practices such as 'direct seeded rice' in paddy and 'zero tillage' in wheat which is essential for sustainable agriculture and environmental protection. The blog was published by the 'Global Landscape Forum' in 2017 and received appreciation from the agricultural scientists, students, and audience. She was also invited to International Rice Research Institute (IRRI), Kenya center to share her experience in paddy-dairy integration and the DSR adoption done successfully.

Economics- Returns over Investments



Dairy farming in India is the laggard within agriculture. There are huge knowledge gaps in efficient raw milk production due to lack of deep engagement with dairy producers on improving the breeding, nutrition, disease management and milk quality keeping the sector most backward even though it is the most important sector in terms of its potential contribution to improving the lives of millions of farmers, for the nutritional security of the people of India and for the environmental sustainability. Most milk in India is produced by a very large number of dairy farms having 5 to 15 low-yield cattle with typical productivity of 900 litres per year. There is some emergence of small and mid-size farms (20-50 cows) but the number is very small, and they usually struggle and fail because of gaps in knowledge, markets and finance.

The carbon footprint per litre of milk in India is very high because of low productivity of farms and cattle. No milk processor works directly with farmers to help them improve their operations and profitability. Milk scattered over a very large area gets aggregated at collection centres run by milk agents without cooling facilities and processors buy milk from milk agents. By the time milk reaches the 'Bulk Milk Cooler', it already has a very high bacterial load. Parameters like aflatoxin, somatic cell count and bacterial count are never checked. Thus, providing high quality milk and milk products to demanding consumers remains a challenge and the product that consumers get is low in quality, taste and far from the natural quality of milk.

The dairy farmers are unable to build efficient farms because of gaps in knowledge, markets, finance and farmer leadership. The milk price they get is too low to make any improvements and the vicious cycle continues keeping the dairy producers trapped in poverty. Processors do not get quality milk because of unavailability of modern



farms. Finally, consumers are getting low quality milk and milk products. The carbon footprint per litre of milk needs to be reduced and the country must move towards efficient raw milk production and consumer should get good quality milk.

There is huge market for dairy sector but the entrepreneurship is missing. Nikki and Gaurav have spent almost a decade committed to bridge this entrepreneurial gap and their vision is to build India's most loved dairy company owned by the dairy farmers. This will involve following steps:

- A Centre of Excellence (COE) for Dairy Production will be established which will promote learning, research, extension and breeding of cattle. The COE will have its own milk processing and marketing.
- The dairy farmers will be provided needed help to make transition to more efficient and sustainable methods of milk production and organizing them in a framework (partner farms) to collect and supply milk to our milk processing plant. The main aim here is to help them build successful small to medium size farms (20- 100 Cows).
- A strong and committed leadership will be built among our partner dairy farmers.
- Next-level milk marketing campaigns will be organized

There is a need to develop a supportive and positive ecosystem around dairying to see positive economic, social, and environmental growth. 'Mango Dairies' envisions to work with the partner dairy farmers and support them through the partner farm service center that will provide them various key services including breeding, forage and feed, veterinary and other essential dairy services to make them efficient right from the start. 'Mango Dairies' will be engaged deeply with the producers to ensure and collection their milk at a remunerative price so that farmers can focus and grow their dairy.

Given that the dairy farmer has good cattle breed and the supportive ecosystem taking care of essential needs such as breed development, provision of good nutrition and veterinary support, a well-managed 10 cow dairy farm's return over investment will be INR 32,750 per month as per the details given below:

- Cost of one cow = INR 1,00,000
- Cost of 10 cows = INR 10,00,000
- Equipment's cost = Rs 1,00,000
- Construction Cost = Rs 1,50,000
- Total fixed investment = INR 12,50,000



Interest cost at 10% per annum = INR 1,25,000

Depreciation of cattle at 10% per annum = INR 1,00,000

Depreciation of equipment at 10% per annum = INR 10,000

Total depreciation on fixed assets = INR 2,35,000

Cost of labor = 1.5 men/day @ INR 300 per man per day = INR 13,500 per month or INR 1,62,000 per annum.

Cost of fodder on 2.5 acres' land = INR 1,00,000 per annum

Cost of a concentrate feed @ 4 kg/cow for 300 days and @ 2 kg/cow for 65 days = 13,300 kg @ Rs 15/kg = INR 1,99,000 per annum.

Mineral mixture cost = INR 2,000/month = INR 24,000 per annum

Veterinary charges per annum = INR 25,000 (INR 2,500 per cow per year)

Electricity and fuel charges = INR 15,000 per annum (INR 1,500 per month)

Deworming, vaccination, anti tick sprays and other medicinal expenses per annum = INR 20,000 (INR 2,000 per cow per annum)

Miscellaneous cost = INR 15,000 per annum

Total variable cost per annum = INR 5,60,000

Total cost = Total fixed cost + Total variable cost = INR 2,35,000 + INR 5,60,000 = INR 7,95,000

Sale of milk = 12 litre per cow per day for 300 days @ INR 33/ Litre

Total revenue = INR 11,88,000

Net profit from a 10-cow model dairy farm = Total revenue – total cost = INR 11,88,000 - INR 7,95,000 = INR 3,93,000 per annum or INR 32,750 per month.

Manure is not considered in the above calculations which is a very important by product and extremely beneficial input for the soil. It reduces farmers' dependency on the purchase of chemical fertilizers. The year-wise economic returns over investments in dairy farming at Mango Dairies during the period 2015-2021 is given in Table 2.

There is a huge scope of improving the income from cow based dairy farming which got impacted adversely in the year 2017 after the Government banned



Table 2. Year-wise economic returns over investments in dairy farming (2015-2021)

Year	2015	2016	2017	2018	2019	2020	2021
Items	Cost/ltr milk (Rs)	Cost/ltr milk (Rs)	Cost/ltr milk (Rs)	Cost/ltr milk (Rs)	Cost/ltr milk (Rs)	Cost/ltr milk (Rs)	Cost/ltr milk (Rs)
Nutrition (N)	20	20	19	17	16	16	16
Labour (L)	6	6	6	6	6	6	6
Energy (E)	4	4	4	4	4	4	5
Depreciation & Others (D)	2	2	2	2	2	2	2
Total cost per liter of milk	32	32	31	29	28	28	29
Farm gate price realized (Rs)	32	32	33	33	33	33	34
Annual milk production (liters)	54,750	87,600	1,31,400	1,42,350	1,64,250	1,86,150	1,86,150
Annual revenue from sale of milk (Rs)	17,52,000	28,03,200	43,36,200	46,97,550	54,20,250	61,42,950	63,29,100
Annual revenue from sale of cows (Rs)	0	3,00,000	1,00,000	2,00,000	1,00,000	1,20,000	1,00,000
Total cost of production (Rs)	17,52,000	28,03,200	40,73,400	41,28,150	45,99,000	52,12,200	53,98,350
Total revenue (Rs)	17,52,000	32,03,200	44,36,200	48,97,550	55,20,250	62,62,950	64,29,100
Net profit (Rs)	0	3,00,000	3,62,800	7,69,400	9,21,250	10,50,950	10,30,750



the sale of aged and unproductive cattle for slaughter at the country's livestock markets and imposed strict documentation requirements for any sale and purchase of bovines. This has resulted in income loss for farmers through cattle sales and increased the population of stray cattle that are anyway dying eating plastic on roads or by accidents and of hunger. The law in force has hit hard the small and the marginalized farmers who now have no option but abandon their unproductive cattle whom he can no longer afford to feed since the income realization from the sales is made zero. The Government and policy makers must rethink to lift the ban on sales as this has been non-viable for farmers and very unsustainable environmentally.

The vision of 'Mango Dairies' is to bridge the knowledge gap of the farmers and work with them and the farmer producers organizations (FPOs) in a way that dairy farming improves and becomes viable for milk producers and customers to get the highest quality milk and milk products. She spent several years to get the domain knowledge and experience on efficient raw milk production, and she is continuously learning and taking guidance from the PUM Netherlands on the best practices of dairy farming. She feels that it is neither possible nor there is a need for a farmer to go through such a long journey before she starts making good returns and implement sustainable practices. There is need to be very quick to adopt sustainable, regenerative, and efficient agricultural practices especially in dairying.

Lessons Learnt



Dairy farming in India is highly undeveloped and hence also one of the laggards and the toughest sector within agriculture. Nikki had to face several challenges and still continues to face and overcome problems on daily basis. Livestock sector especially dairy is time consuming, challenging and needs very close monitoring. She recalls the time when she knew nothing about milk production, cattle management and how she used to sit for hours in the sun at the backyard dairy and how she started maintaining the cow level data on daily basis on her register noting down the total milk yield of every cow, heat observed if any, artificial insemination date, pregnancy diagnosis date, delivery due date, deworming and vaccination status, etc. Everything was new to her, and she spent her days, weeks and years gathering and gaining the knowledge with the strong support from her husband Gaurav who strongly believed in the need to completely change the scenario of dairy farming that exists in India currently.

She spent lot of time and capital in gaining insights and on developing the dairy farm. When she married with Gaurav in 2011 in village Tanda Vijaisi, family members, several relatives and friends would often ask them that after having such a good education why they chose to reside in a village. Nikki would be asked very frequently of what she will achieve at the farm, and it is better for her to pursue a bright corporate career. She ignored all such negative remarks and worked with full dedication at her farm.

With the recognition that she started getting from various agricultural organizations and international forums resolved the doubts that her near and dear ones had who now believe and encourage the efforts and the strength with which she stayed committed to her cause of transforming dairy farming. Though sustaining a dairy farm was not at all easy in initial years but as her own



knowledge improved, the net profits started improving overtime. She knew from the very beginning that to contribute positively on ground in dairying, she must work very hard and sustain herself on limited returns. Gaurav's passion to make difference in dairy and develop the most loved dairy company owned by farmers was the major inspiration for Nikki. His support has been immense in the entire dairy journey in which she tried to give herself completely.

Uttar Pradesh has the highest cattle population in the country but the productivity per cattle is extremely low and the state till date has negligible well-organized commercial and sustainable dairy farms. In 2011, she knew nothing about dairy farming and coupled with this the absence of organized dairy farm made things even more complicated for her.

The cattle breeds were purchased from Haryana, and it was very tough and costly to transport cows from there to the farm in Uttar Pradesh. Gaining every bit of essential information, needed lot of time, energy and finance as it all had to be done by practically learning the concepts from developed dairy farms of Punjab and Haryana. In her village in 2011, she also recalls how poor the internet connectivity was and how she would travel 20 km daily to Pilibhit City to have access to internet to send mails or do some research/ study on dairy. The roads were bad and there was limited supply of electricity.

She soon started writing blogs on the need of youth (men and women) to be part of agriculture and the fact that the real change that our world needs for the well-being of its people and planet is not possible without the committed efforts of the educated young people on the ground in rural areas. She has also laid emphasis on various forums on the need of all stakeholders to come together and work towards development of dairy sector in India. Every problem that they have faced in dairy, they have made sure that the solution to that problem is shared with the maximum number of farmers either through farmer meetings or through various social media platforms.

Nikki with huge support from Gaurav has been able to give Pilibhit district one good dairy farm that was absent earlier, and it is a model dairy farm for several farmers who can easily avail any and as much information they want on efficient raw milk production. The constraint that she faced on bridging the knowledge gap about dairying when she started her journey has been at least solved by her for other dairy producers in the region and adjoining areas.



She kept strong focus and stayed committed to her work and has ensured that there was no gap in cattle breeding, nutrition, and cattle comfort. She worked on all these essential pillars of efficient raw milk production and wherever she had doubt, she would not delay in seeking the know-how. She was quick to call a dairy farmer/ veterinarian/ dairy expert and would also do detailed study by herself. Her own rigorous daily engagement at farm resolved several issues and enabled her to succeed as a dairy farmer. The dairy farmers were provided training on essential pillars of cattle management at her Dairy Unit in Pilibhit (Uttar Pradesh) (Fig. 34).



Fig. 34: Training of dairy farmers for better cattle management at Nikki's dairy unit in Pilibhit

Key Factors to Success



Nikki believes that while she has been successful as a dairy farmer, the real intention and aim is to build a dairy company that can benefit dairy farm producers for which she and Gaurav are working hard to bring positive impact in dairy sector across her state and the country. From knowing nothing about farming, dairy and rural life, she immersed and devoted herself completely and strongly to uplift the dairy farming sector. Every difficulty and obstacle strengthened her to keep going in her mission to work on ground in the rural to transform dairying. At the start of her journey in dairy, almost everyone tried to stop her from entering dairy sector because of its unviability and tough nature. But Nikki had chosen this profession exactly to solve the problems. She stated that the purpose of education is not to settle in the comforts of city and do something that can only fetch money and create no impact. At a very young age, she decided that she has to contribute meaningfully to rural areas and agriculture and hence she chose dairy farming.

In the past ten years, she could see herself evolving and becoming a resilient person and entrepreneur, but she will consider herself truly successful when she is able to build a milk company contributing positively to uplift the farmers and build a thriving community of dairy farmers working as entrepreneurs committed to produce the highest quality raw milk efficiently.

She has grown dairy farm from scratch. The journey in dairy in rural India has been full of difficulties and she can comprehend very well what a dairy producer in India has to go through. She considers herself fortunate enough to get good education and combined with her positive attitude and strong will power to contribute to rural India, she could attempt and overcome several failures in her ten-year journey. Without wasting any single day, she immediately started sitting in the sun post marriage. She would often travel to developed dairy farms, academic



institutions and attend seminars, conferences so that she could strengthen her knowledge base. She and Gaurav did lot of study on dairy farming, cattle and buffalo breeding, forages, animal comfort, animal nutrition and sheds making, etc.

Building a dairy farm and developing insights into efficient raw milk production enabled them to work towards their vision of forming India's most loved milk brand operated and run by farm owners. It is the dream on which both have been striving to accomplish and they hope they can build such company which is the only way to transform the lives of dairy farmers and making raw milk production efficient and environmentally sustainable. Dairy development is a powerful tool for achieving economic growth, food security and eradicating poverty.

Nikki's commitment to continually learn and improve her knowledge has been one key factor behind the success. She got disconnected from the outside world when she settled in the interiors of Uttar Pradesh in 2011. She made all possible efforts to get connected with agricultural and dairy institutes, good dairy entrepreneurs, cattle breeding and nutrition experts in India as well as abroad. She reconnected with the people, agriculture experts and youth through her blogs which she shared through social media. She has written several blogs on challenges and opportunities in agriculture, conservation agriculture, integration of poplar and dairy farming, etc.

Their ability to get the dairy basics such as providing green forages throughout the year, airy sheds, comfortable bedding and free access to food and water, has been vital to their success in dairy farming. Good work in cattle breeding has ensured the sustainability and growth of dairy farm. They have also always followed strict biosecurity norm at their dairy farm to prevent entry of diseases such as Foot and Mouth Disease (FMD). Timely vaccination, deworming and anti-tick sprays all play very crucial role in the well-being of the herd. It is important for the farmers to maintain cow level data especially date of calving, heat dates, date of insemination, pregnancy diagnosis and result. These small steps do add great value.

Resilience is the most important which becomes key to turning challenges and failures to success. Without resilience, it is difficult to bring real change/success. When the bigger purpose of life is clear, one does not get afraid of the setbacks and continues to walk the path without fear. Nikki has faced several setbacks, but all these only made her clearer and a very resilient entrepreneur. Deep commitment, lot of patience and continuous innovation are the key factors for the success in dairy farming.



Also, their continuous presence on farm in the rural and strong relations with farming community has been another important factor behind the successful farm. She believes that community living and working collaboratively with farmers is always helpful especially in challenging sectors such as dairy. Running such operations all alone can be very tedious and tough. Hence, she and Gaurav decided to form the dairy focused FPO called 'Terai Farmer Producers Organization (TFPO)' to bring together dairy producers who will form a supportive and strong ecosystem to promote dairy farming in the region. They believed and promoted in collective work which holds strong promise and helps in overcoming several obstacles.

She considers herself fortunate enough to meet several farmers, good veterinarians, dairy experts and mentors who have played an instrumental role in guiding and motivating them throughout their journey in dairying. There have been several people in the journey who have believed in Nikki's efforts in dairying in rural and have motivated her to keep going and these encouragements have been of great help. She got support of several farmer families, her own family, and friends for continuous progress in this difficult task. Mr Arvind Bhargava a senior veterinary doctor has time and again guided her and farmers in the region over phone, completely free of cost, whenever they faced health related problems in cattle.

Robynne Anderson, Director General of Emerging Ag inc. which is the secretariat for the International Agri food Network (IAFN) and the Private Sector Mechanism (PSM) of the UN Committee on Food Security (CFS) believed strongly in Nikki's involvement in dairy farming and after listening to her presentation at FAO, Rome, she made her a member of CFS where she is often asked to give feedback on the situation of agriculture in India and how it can be improved as a young dairy entrepreneur at the International Forums and Committee on World Food Security.

Nikki and Gaurav are working to build a farmer owned dairy company that brings back value-chain profits in milk sales to farmers. 'Mango Dairies' is a unique start-up formed in 2021 with a vision to be a dairy processing company where the supplier farmers get back value-chain profits of the company. They are supported in this effort by industry veterans Mr Hemendra Mathur, Dr Anne Roulin and Ad van Velde. Mr Hemendra Mathur is working as Venture Partner with Bharat Innovation Fund, investing in early stage deep-tech start-ups across sectors. He is also Co-founder of 'ThinkAg' – a platform for accelerating the adoption of



innovations in agriculture space. He is also the Chairman of FICCI Task Force on Agri Start-ups. He has been guiding and mentoring Nikki for the last two years and he was the first person who showed massive confidence and support in their desire to form a farmer owned dairy company.

Mr Ad van Velde is a top Dutch dairy entrepreneur with a broad interest in agriculture sector and food production worldwide. He is the owner of Husingo Dairy Farm. (<https://husingodairy.com/>), also President of 'Global Dairy Farmers' (www.globaldairyfarmers.com) which is a network of leading dairy farmers across the globe.

Dr Anne Roulin has been a great mentor to Nikki since the past five years. Across her career, Dr Anne Roulin has worked in academia, in the private sector (Tetra Pak and Nestlé) and as an entrepreneur in the UK, Switzerland, the USA, Italy and France. Her studies were in Chemistry and Materials Science. Since 1988, she has been involved across the diverse aspects of sustainability including environmental, social, and economic considerations with applications in many countries. During the past few years, she has focused on making sustainable nutrition. She has always been very supportive and encouraging Nikki in her journey in dairy farming.

Impact of the Work in Dairy Sector



Every year more than 500 farmers from different parts of Uttar Pradesh visit Nikki's dairy farm which has emerged as a model dairy farm in the region where farmers keep coming to take know-how on various aspects of cattle management and efficient raw milk production. Lot of discussions around dairy farming takes place with the farmers at her farm. She recalls the absence of single modern dairy farm when she started in 2014 and now after the Chaudhary Farms Dairy (renamed now Mango Dairies Farm), a few farmers also got encouraged and took lead in establishing commercial dairy farms. With their advice, about 10 modern dairy farms are successfully operating in the region which act as model dairy farms in their respective regions. Several farmers in the state have benefitted from seeing the infrastructure and understanding about various aspects of cattle management after visiting the Mango Dairies Farm. However, Nikki through the FPO is striving to build a lot more on the dairy potential which she believes is not yet fully realized.

The local animal husbandry department of Pilibhit keeps organizing smallholder dairy farmers; visit at their farm to improve their knowledge base on cattle management. This is beneficial for them as the dairy farm visit and visit of fodder plots improves their knowledge and awareness on what better practices can be adopted to improve milk production. Nikki also keeps on holding meeting with local veterinarians and paravets in the region to keep updated about the dairy farming situation in the region. Doctors from Bhartiya Agro-industries Foundation (BAIF) visited Mango Dairies in December 2021 informing about availability of sexed semen at very nominal prices and explained to dairy farmers how to get best results from its insemination (Fig. 35).



They keep conducting the trainings of dairy farmers at their dairy farm on various areas of cattle management. They invite dairy experts in breeding, nutrition who then give detailed presentation/ training on those aspects to the farmers. These developments are very new to Uttar Pradesh and never happened before. The presence of modern dairy farm in the region has improved dairy farming practices and the breeding . Farmers come to their farm and implement the knowledge gained at their own which has helped them to improve net returns. Nikki strongly believes that there is a huge scope of improvement and development in dairy farming in her region and neighboring areas.



Fig. 35: Visit of BAIF Doctors at Mango Dairies
(December, 2021)

A few examples to illustrate as to how to give a push to dairy farming in the region are given below:

1. Shanti, a wage earner from nearby village approached Gaurav with the interest to have an additional income from milk sales. He purchased three good heifers from them at a very nominal price in 2014 and in 2016 three of them started producing about 12-15 litres milk per day. He and his family started consuming fresh milk 4-5 litres per day from the cows and the remaining milk was sold by him to households at a price of Rs 35/litre fetching him daily cash of INR 700. Shanti's family takes care of the small herd of 5 cows and 2 heifers that he



Fig. 36: Shanti, a wage earner with her cows purchased from Mango Dairies



owns today. His net annual income from the milk sales is around INR 1,50,000 which has not only improved their financial situation but also the health of his family tremendously (Fig. 36). With hard work and this additional income, Shanti, has also been able to purchase a small piece of land in the village on which he has planted poplar trees. Underneath poplar, he grows fodder for his cows.

Farmers often face shortage of green fodder and Mango Dairies supplies green fodder to a few farmers as and when needed as stock of wheat straw and paddy straw is also maintained to cater to such needs by the farmers. The farmers who earlier would burn paddy now ensile paddy and make use of it to feed their growing heifers.

In-house feed unit is also installed at Mango Dairies to prepare cattle feed very cost effectively. Earlier Nikki and the farmers in the region had to incur huge costs to purchase branded cattle feed that would often come from Punjab and Haryana but now with the help of nutritionists, she prepares the cattle feed herself and this cost-effective nutritious feed is also made available to farmers.

2. Mr Sanjay a farmer from village No. 7 Shiyam, Adarsh Nagar, Uttarakhand purchased two pregnant HF cross heifers from Mango Dairies in October 2020. The farmer got very good milk yield from them averaging 20 liters per day (Fig. 37) and healthy female calves. He purchased another two pregnant heifers from her again in 2021. He started retailing this milk from his shop and today he also collects milk from dairy producers and now operates a successful milk retail outlet under the name of Radhey Radhey in Gadarpur from where he sells up to 400 liters of milk per day and also sells milk products such as curd, ghee, khoya and paneer.



Fig. 37: Mr Sanjay at extreme right from Uttarakhand taking good milk yield from well-bred cattle purchased from Mango Dairies



3. Mr Sakattar Singh, a farmer from village Musakoni, purchased 6 Jersey heifers from her in the year 2016-17 and started operations under the continuous supervision and learnings from them. Today he runs a highly efficient and successful dairy farm with a herd size of 10 cows and 6 heifers and the total milk



Fig. 38: Farmer Sakattar Singh started his farm by purchasing jersey heifers from Mango Dairies in 2016



Fig. 39: Jersey herd of Sakattar Singh (2021)

production of 125 litres per day. Earlier he was only doing paddy-wheat farming on 5 acres of land and the addition of dairy unit has added an income of over INR 20,000 per month. His knowledge base in dairy is now very strong which he shares with other farmers in his village who look up to him for guidance on efficient raw milk production and for purchase of well-bred calves and heifers (Fig. 38, 39).

The formation of FPO and working collectively bring benefits to all farmers and makes everyone financially stronger. Nikki and Gaurav visited the forest of Terai where farmers' rear buffaloes and produce very high-quality milk (Fig. 40). There is a danger from tiger and the unavailability of electricity and good market access also pose limitations



Fig. 40: Visit to a forest based dairy farming system in the forests of Terai in Feb 2022



on their viability and income. These farmers are now part of the Terai FPO, and procurement of milk from these farmers would be started soon at remunerative returns. Nikki is working with these farmers to ensure that they get facilitated and can grow further and faster.

She has been writing passionately in her blog- Integrating Dairy and Agroforestry- urging educated youth to take up farming in rural India since 2014 which encourage several farmers in India and her work was also recognized by several organizations in the state of Uttar Pradesh and the country and also globally. In recognition of her work, she was felicitated



Fig. 41: Nikki felicitated by ICRAF for her writings on integration of dairy and agroforestry (2014)



Fig. 42: Visit of small/ marginal farmers at Mango Dairies for training on winter forages (2022)

by the International Center of Research for Agroforestry (ICRAF) in 2014 (Fig. 41).

Impressed by the progress of Nikki's work, several smallholder and marginal farmers visited Mango Dairies in 2022 for training on production of winter forages so that they can also learn the techniques and start the cultivation of

winter forages at their respective fields for higher fodder production and better income from dairying (Fig. 42).

Having set-up a commercial modern dairy farm with good balanced breeds, availability of high-quality forages throughout the year has ignited the interest of farmers in dairy farming. With the presence of no single organized dairy farm in Pilibhit and the adjoining areas when both of them forayed into commercial dairy farming in 2014, today inspired by their dairy farm and ease of access of



information and various other services, farmers' interest in dairy farming has grown manifold. Both are working with the Government and investors to come together and give push to dairy farming in the region. Their intensive work on balanced breed development and tree- forage integration has led to awareness amongst farmers on the importance of having good breeds and



Fig. 43: Meeting at Mango Dairies with the local Paravets and Veterinarians of Pilibhit, Jan 2022

breed development program. Farmers have adopted the practice of tree- fodder integration. She gets lot of demand for growing heifers and cows from farmers, and she has been selling heifers from the farm every year. This is multiplying the number of cows with good genetic make-up in the region which is important for dairy development. A meeting was organised with local paravets and veterinarians during January 2022 (Fig. 43). The milk that they produce is of very high quality and consumers and institutional buyers in the Pilibhit City are very happy with the wholesome nutritional milk that they are getting. There is a growing demand for their milk and milk products.

Hundreds of farmers have got inspired by their work in dairy farming and many farmers in the region want to diversify from paddy-wheat rotation to crop and dairy farming integration. Farmers are increasingly adopting conservation agriculture (CA) practices such as 'DSR' for paddy and 'Zero tillage' for wheat and the paddy straw is being ensiled by the dairy producers for the cows. This straw earlier was burnt by them. Nikki believes that there has been positive change in farming practices and farmer awareness levels have gone up through their deep engagement with the farmers in the region however at the same time she feels that there is a huge potential to bring improvements in dairy farming.

Under their guidance, a modern and well-organized dairy farm having high performing herd was set-up in Lakhimpur are in 2021 which amply shows the impact of their work in the region (Fig. 44). She also used to visit nearby dairy producers assisting them on various aspects of dairy management which greatly helped them in running their dairy units very efficiently (Fig. 45).



Fig. 44: Modern organized dairy farm having high performing herd set-up in Lakhimpur area in 2021



Fig. 45: Nikki's visit to nearby dairy producers assisting them on dairy management (2020)

Her good work received a wide popularity in the region and as a result, the students of ICAR-Indian Veterinary Research Institute (IVRI), Izzatnagar, Bareilly frequently visit the Mango Dairies to learn about the techniques for efficient dairy management (Fig 46).

Celebration of International Milk Day was organized at her dairy farm on June 1, 2019 and the women from nearby villages and milk customers participated and they were apprised about the importance of having wholesome glass of farm fresh milk for proper nutrition (Fig. 47).



Fig. 46: Day trip by the students of ICAR-Indian Veterinary Research Institute, Izzatnagar, Bareilly (2016)



Fig. 47: Celebration of International Milk Day at Nikki's dairy farm on June 1, 2019

Specific Suggestions for Other Entrepreneurs

To succeed as dairy farming entrepreneur in India, focus must be on getting the basics right as follows:

- Sufficient availability of quality forage – green cut, silage and hay
- Spacious and airy housing with comfortable bedding
- Free (24 × 7) access to food and quality water
- Balanced cross breeding strategy
- Rigorous work on achieving timely cow pregnancy
- Active disease management
- Independent milk sales planning or collaborating within FPO to have own milk brand and market.

Animal husbandry especially dairy is a risky profession and needs strong focus, committed efforts and lot of patience. It is important that good networks/ collaborative efforts with the farmers' community and various other stakeholders is continuously built for the growth and development of the sector.

As an entrepreneur, one needs to have a sound financial strategy in place with a clear focus on cash flow. The journey of entrepreneur is tough especially in agriculture sector but with a strong purpose and vision to transform lives of people and meaningfully contribute to attain social, economic and environmental



sustainability makes the journey worthwhile and hence all efforts must be made on ground for the growth and development of the dairy sector.

New Developments Creating Good Impact

Mango Dairies Creamery

After building one of the most efficient organized dairy farms in Uttar Pradesh in March, 2022, she established Mango Dairies Creamery/ Processing Unit and started milk processing at their farm where they are doing value-addition of milk from their dairy farm as well as of partner dairy farmers. To learn about milk processing in detail and to take hands-on experience, She applied for training at ICAR- National Dairy Research Institute (ICAR-NDRI), Karnal (Fig. 48). The 15-day



Fig. 48: Mango Dairies Creamery, first batch of curd, (July 17, 2022)

training 'Entrepreneurship Development Program on Processing of Milk and Milk Products' conducted by ICAR-NDRI immensely benefitted her when she commercially started milk processing unit – Mango Dairies Creamery. Finally, in July 2022, Mango Dairies started the Creamery and launched curd, cow *ghee* and farm fresh whole cow milk as main products. Curd

is branded as '*Kisaan Samman Dahi*' and *ghee* is branded as '*Kisaan Shakti Deshighee*'. Mango Dairies Creamery also offers packaged farm fresh whole cow milk.

Partner Farms and FPO Value Chain Partnership Business Model of Mango Dairies

Mango Dairies has started procuring milk from dairy producers called as 'Partner Farms'. Nikki works closely with partner farms and provides support in efficient milk production which involves support like providing maize silage, forage seeds, hay and concentrate to them. She envisions developing Dairy Farmer FPOs which will become milk value-chain partners of Mango Dairies. Hence,



she is helping partner farms become members of 'Terai Farmer Producer Company Limited', the farmer producer company being supported by Mango Dairies. Partner farms, as members of the company are being trained to take up commercial silage making, milk collection, and milk testing, etc. and she visits the partners farms to provide them necessary training (Fig 49).

Recently, Pilibhit FPOs Organic Hub was launched by the District Magistrate of Pilibhit which is the first ever attempt to open an Organic Hub in Uttar Pradesh. Mango Dairies along with 'Terai Farmer Producer Company Limited' are partners of this hub.



Fig. 49: Milk and milk products being offered by Mango Dairies Creamery

Collaboration with PUM Netherlands Senior Dairy Expert Tjeerd Djkistra

Nikki's collaboration with PUM Netherlands has continued and in April 2022, Tjeerd Djkistra, a Dutch dairy farmer and senior dairy expert who had been coaching her on farm development and improvement visited Mango Dairies creamery in Village Tanda Vijaisi, Pilibhit for 15 days (Fig. 50 & 51) Intensive work was undertaken on reviewing various aspects of animal management including animal nutrition.



Fig. 50: Nikki visiting at a partner farm



Fig. 51: PUM Netherlands Senior Expert Tjeerd Djikstra visiting at Nikki's Farm

They feel confident and very positive about the vision that their company Mango Dairies holds to making dairy farming in India efficient, profitable and environmentally sustainable. They are committed to the vision of making Mango Dairies India's most loved dairy brand for both the dairy farmers and the consumers. District authorities also visited her farm and appreciated the work (Fig. 52).



Fig. 52: Nikki with Mr. Pulkit Khare, District Magistrate of Pilibhit Mr Vinod Yadav, District Agriculture Officer and Hon'ble Minister Mr. Sanjay Gangwar during launch of Pilibhit FPOs Organic Hub



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As an entrepreneur, one needs to have a sound financial strategy in place with a clear focus on cash flow. The journey of entrepreneur is tough especially in agriculture sector but with a strong purpose and vision to transform lives of people and meaningfully contribute to attain social, economic and environmental sustainability makes the journey worthwhile and hence all efforts must be made on ground for the growth and development of the dairy sector.

About the Author



Nikki Pilania Chaudhary

Nikki is a graduate in Economics from Maitreyi College, Delhi University and after completing her Master's in Business Economics and Finance from University of Surrey, U.K., she got married in 2011 to Gaurav who is a postgraduate in Economics from Delhi School of Economics. She is inspired by his decision to lead a rigorous life and to contribute meaningfully in agriculture sector in rural India. Nikki decided to move with him at his family farm post marriage and started her journey in an unknown field of agriculture and dairy. She has been residing at the farm in village Tanda Vijaisi, Pilibhit, Uttar Pradesh with him since 2011 and is dedicated to transforming the dairy scenario in India which currently she finds very challenging for the dairy producers and hence believes that all stakeholders must take-up the dairy sector seriously for the wellbeing of environment, dairy farmers, consumers and the cattle.

In 2011 and 2012, Nikki along with Gaurav planted about 5,000 poplar trees at their farm. They followed best package of practices and got very high timber yields of poplar in six years' time. These practices for higher timber yields have been shared by them with several hundreds of farmers in the region. Nikki's research paper entitled, "Poplar Culture on Farmland: Farmer's Experience from Uttar Pradesh" was published by Forest Research Institute, Dehradun in *Envis Forestry Bulletin* -2012. Nikki was invited at the 24th Session of International Poplar Commission held in 2012 at Forest Research Institute (FRI), Dehradun to present her work on poplar agroforestry and share the economic returns of poplar-based agroforestry *vis-à-vis* paddy-wheat crop rotation.

Nikki has taken several initiatives in agriculture to explore and come up with the best agricultural practices that are economically beneficial and



environmentally sustainable. She promotes conservation agricultural practices such as zero tillage in wheat and direct seeded rice in paddy amongst farmers in the region. She has been actively writing blogs on challenges and opportunities in agriculture and her blogs have received huge attention and appreciation. Nikki was awarded for her blog Integrating Poplar with Dairy Farming by the social media Jury at World Congress on Agroforestry held in 2014 at New Delhi, India. In 2016, Nikki was selected as one of the top six youth agripreneurs worldwide by the Global Forum for Agricultural Research (GFAR) and was invited to the third Global Conference on Agricultural Research and Development (GCARD3) held at Johannesburg, South Africa in April 2016. She studied indigenous cattle breed *Gir* and *Jaffarabadi* buffalo from the 'Seed Fund' that she received from GFAR.

Nikki has been invited thrice to Food and Agriculture Organization of the United Nations (FAO), Rome, Italy as a young dairy farmer/agripreneur to share her insights into the dairy farming sector in India where she has boldly expressed her concerns as a young farmer/ entrepreneur about the unsustainable scenario of dairy farming in India that needs huge attention. She has been invited as a keynote speaker at various national and international forums to share her experience as a young dairy farmer.

Nikki currently serves as a Board Member at the Youth Alliance for Zero Hunger that was formed as an outcome of the session held by young agripreneurs at FAO, Rome where it was felt by the FAO and the Member States to include young people involved in agriculture / allied activities in the policy making process so that best possible decision can be made. Nikki is also the member of the Committee on World Food Security since 2019. In Feb 2021, Nikki was also invited by All India Radio at their studio in New Delhi where she was asked to speak about her journey in dairy farming in rural India and her interview was aired and received lot of positive feedback from people and the youth. In 2021, Nikki co-founded 'Mango Dairies' with Gaurav that aims to deeply engage with milk producers on producing high quality milk efficiently. The high-quality whole milk and milk products would be sold to consumers under its own brand name. Nikki aims to make dairying profitable for the dairy producers and with support of Gaurav and a few farmers has also established a dairy focused FPO called '*Terai Farmer Producer Company Limited*' in June 2021 with the aim to do strong collaborative work together with the farmers to uplift and strengthen dairy farming as well as dairy farmers. Nikki's aim is to transform dairy farming in India and build a thriving community of dairy farmers and at the same time deliver the highest quality milk and milk products to consumers.



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13. Fish Farming in North India-A Success Story by Dr Sultan Singh, December, 2020.
14. Dr MS Swaminathan Award for Leadership in Agriculture - A Compendium, October, 2020.
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